



Section 8: Numbers

For all technical and scientific reports and publications published in-house, use the *modern scientific number style*¹ described in Section 8.1. For reports and similar documents having primarily a public audience, as well as all correspondence, use the *general number style* described in Section 8.2.

8.1 Numerals or Words: “Modern Scientific Style”

Use this modern scientific number style for all technical and scientific reports and published publications.

The conventions presented here revise what has often been called the “scientific number style.” That style generally used words for 1-digit whole numbers and numerals for larger numbers, a distinction that many found arbitrary. The revised or “modern scientific number style” treats numbers more consistently by extending the use of numerals to most 1-digit whole numbers that were previously expressed as words. This style allows all quantities to be expressed in a similar manner, and because numerals have greater visual distinctiveness than words, it increases the profile of quantities in running text.

This objective is further facilitated by the use of words instead of numerals for numbers appearing in a context that can be thought of as only secondarily quantitative; that is, when a number’s quantitative function has been subordinated to a nonquantitative meaning or the number is used idiomatically, it should be expressed as a word (for example, *the sixty-four-thousand-dollar question*).

Developing recommendations for *zero* and *one* was more difficult. For these numbers, applying consistent logic (numerals for quantities and words otherwise) would often increase tedium in making decisions about correct usage and create an inconsistent appearance because *one* in particular has a variety of functions and readers might not quickly grasp the logic. Therefore, simplicity and consistent appearance have been given priority for these 2 numbers. For example, *one* can be used in ways in which

¹ Reproduced through courtesy of the Council of Biology Editors (see *CBE Style Manual* Subcommittee, 1998. CBE Views 21(1):14–16).

quantity is irrelevant: as a personal pronoun or synonym for *you* (*one must never forget that...*) or as an indefinite pronoun (*this one is preferred...*). Zero and *one* are also used in ways that are more like figures of speech than precise quantifications (*in one or both of the...*, *in any one year...*, *...a zero-tolerance policy*). In addition, the numeral 1 can be easily confused with the letters *l* and *I*, particularly in running text, and the value 0 can be confused with the letters *O* or *o* used to designate a variable.

a. Cardinal Numbers

Because quantitative elements in scientific writing are of paramount importance, whole and decimal numbers in scientific text, titles, headings, tables, and figure captions should be expressed as numerals rather than words. This form increases their visibility and distinctiveness and emphasizes their enumerative function.

Examples: *3 hypotheses* *7 samples* *52 trees*
 328 amino acids *4 times* *0.5 mm*

Numerals are also used to designate mathematical relationships, such as ratios and multiplication factors.

Examples: *5:1* *4-fold* *1000x magnification*

There are 4 categories of exceptions when numbers should be spelled out.

1. If logic calls for a number to begin a sentence, title, or heading, then spell out the number. If possible, reword so the number appears elsewhere or join the sentence to the previous sentence.

Examples: *Twenty milligrams is the desired amount, but 15 mg is enough.*
 The desired amount is 20 mg, but 15 mg is enough.
 The drug is administered in a single dose; 20 mg is the desired amount, but 15 mg is enough.

2. When 2 numbers are adjacent, spell out the number that is most easily expressed in words and leave the other as a numeral, or reword the sentence to separate the numbers. In general, retain the numeral with a unit of measurement.

Examples: *The sample was divided into eight 50-g aliquots.*
 The sample was divided into 8 aliquots of 50 g each.

3. Express the whole numbers *zero* and *one* as numerals only when

- they are connected to a unit of measure

1 year 1 mm 1 J 0°C 1-digit numbers

- they are used as assigned or calculated values

with q fixed at 1 when z = 0 a mean of 0

- or they are part of a series or are closely or intermittently linked with numbers other than 0 or 1

0, 1, 5, and 9 were... (series)

1 of 4 subspecies (closely linked)

2 applications instead of 1 were... (closely linked)

between 0 and 2 (closely linked)

3 samples contained..., 1 sample was..., The last 5 samples... (intermittently linked).

- Otherwise, spell out *zero* and *one*.

one of the subspecies was one of the most important

one doctor in one such instance

at one time zero-based budgeting

one reason the zero in Table 3

In supporting scientific ethics one is obliged to....

Of the possible avenues of research, this one is the most promising.

There was one alternative we should have examined.

4. When a number is used idiomatically or within a figure of speech, spell out the word; however, like jargon, figures of speech may be inappropriate for scientifically oriented writing because they may not be readily understood by readers whose first language is not English. Recasting the phrase is generally the better option.

Examples: Expression: *This situation tells us a thing or two about...*
 Reworded: *...tells us several things about...*

Expression: *of two minds*
 Reworded: *undecided*

Expression: *a thousand and one possibilities*
 Reworded: *innumerable possibilities*

Likewise, in situations such as those given below, the number may be used in a way in which the exact numeric quantity is secondary to the overall meaning. In scientific material, rewording to avoid the number altogether may be best. Otherwise, either the word or the numeral may be used.

Examples: Original Phrase: *among the four of us*
 Possible Rewording: *among our group*

Original Phrase: *the two of them*
 Possible Rewording: *both of them*

Original Phrase: *We three*
 Possible Rewording: *We*

b. Ordinal Numbers

Ordinal numbers generally convey rank order rather than quantity. As such, rather than being expressly enumerative (answering the question *How many?*), they often instead describe *which, what, or in what sequence*. Because this function of ordinals is more prose-oriented than quantitative, distinctiveness within the text is less important for ordinal numbers, and nondisruptive reading flow and comprehension take precedence. Potential confusion between the numeral 1 and the letters *l* and *I* is also a consideration.

1. In general, spell out single-digit ordinals (corresponding to the numbers 1 to 9), whether adjectives or adverbs.

Examples: *the ninth time* *a third wave of immigrants*
 were first discovered *the first ducklings emerged*

2. Comprehension is less likely to be impeded by the appearance of the numeric form of 2-digit ordinals (corresponding to the numbers 10 and higher), and the practice of using the numeric form for such ordinals is well established. Therefore, express these larger ordinals as numerals.

Examples: *for a 10th time* *the 98th test run* *the 19th century*

- Express single-digit ordinals in the numeric form if they appear in a series or are intermittently linked with larger ordinals.

Example: *The 5th, 8th, and 10th [not fifth, eighth and 10th/tenth] replications were... We developed 12 hypotheses... We tested the 1st [not first]... The 11th [not eleventh] was...*

- To provide visual cues to comprehension, single-digit ordinals may be expressed in the numeric form if they are used repeatedly.

Example: *Of those 6, we first examined the 4th subject, who... Then we looked at the 5th subject... We finally returned to review the 1st, 2nd, and 3rd subjects...*

Although the general policy for ordinals would dictate that words be used here, the numeric form provides more distinction for the references to the individual subjects. *Subject 1*, *subject 2*, and so on would accomplish the same thing. The numeric ordinals also enhance contrast with the adverbial use of *first* in this example. Whichever style is chosen in this situation — numeric ordinals or the spelled-out form — it should be used consistently throughout a document.

8.2 Numerals or Words: “General Style”

Use this “general number style” for all correspondence and for reports and similar documents having primarily a public, instead of technical, audience.

a. Cardinal Numbers

- Spell out all one-digit numbers, unless they are associated with a unit of measurement or a commonly used symbol.

Examples: *seven deer* *three biologists* *five percent* *six dollars*
7 mm *3°C* *5% (or percent)* *\$6 but \$6.28*

- Use numerals for two-digit numbers, except in the rather unusual situation in which a number is used idiomatically.

Examples: *10 deer* *11 biologists* *15 percent* *\$64 or 64*
dollars

3. Spell out all numbers that are used idiomatically or within a figure of speech such that the exact numerative function has become secondary.

Examples: *"a thousand and one questions"* *"the sixty-four-thousand-dollar question"*
"in any one week" (one = given) But: *in any 1-week period (clearly enumerative)*

4. For closely associated numbers or numbers in a series, if any one of the numbers is two digits, then use numerals for all; if all are one-digit numbers, spell them out.

Examples (series): *three males, four females, and seven unknown*
3 males, 10 females, and 7 unknown

Examples (associated): *from five to six* *two of the four*
from 5 to 11 *2 of the 12*
of the 15 samples, 3 were contaminated and 1 was...

5. Use numerals for all decimal numbers.

Examples: *1.1 million* *0.3 miles* *1.75 units* *...was multiplied by 0.667*

b. Ordinals

For ordinals, follow the new scientific number style, as presented in Section 8.1.b.

8.3 Fractions and Percentages

In general, fractions should be spelled out in running text. Hyphenate all fractions, whether used as adjectives or nouns.

Examples: *One-half (or half) of the subjects....*
Nearly three-quarters of the population....
A third of the study plots....
A two-thirds majority....

For fractional quantities greater than 1, mixed fractions may be used if the precise value is not intended. The fraction should be set close to the whole number.

Examples: *was followed for 3½ years* *about 1¼-km distance*

When the precise value must be conveyed, the decimal or percent form is preferred.

Examples: 3.5 L 27% of the a study area measuring 1.25 x 3.0 km

8.4 Dates

Do not use an apostrophe with years; for example, use the 1970s, not the 1970's.

When writing dates, use no punctuation in the following examples:

on 10 November 1983 we *in November 1983 we* *on November 10 we*

Set the year off in commas when written: "On November 10, 1983, we...."
[Note: some authors omit the second comma after the year, but this is not the ADF&G standard in correspondence.]

8.5 Time of Day

Use either the 12-hour system or the 24-hour clock (military), but not both in the same document.

12-Hour System: Examples include 12:45 AM (ante meridiem) and 9:30 PM (post meridiem). The small cap form (shown) for AM/PM should be used for formal documents. The reduction in point size is not necessary for general correspondence.

24-Hour System: For example, include 0056 hours and 2130 hours [Note: *not* 0056 h or 2130 h; that is, spell out hours because the abbreviation *h* is used to denote an amount of elapsed time rather than a time of day].

8.6 Ranges

a. Technical/Scientific Style

Treat both numbers in a range similarly; do not mix types.

Examples: Use: 40 thousand to 1.1 million...
 Or: 40,000 to 1,100,000...
 Not: 40,000 to 1.1 million...

Fully state both numbers in a range so they can each stand alone.

Examples: Use: *56 thousand to 74 thousand...*
 Not: *56 to 74 thousand...*

 Use: *56,000 to 74,000...*
 Not: *56 to 74,000...*

Use *to* to separate ranges introduced by *from*; use *and* to separate ranges introduced by *between*. Otherwise, use an en-dash (–) to express ranges.

Examples: Use: *from 33 to 124 of the...*
 Not: *from 33–124 of the...*

 Use: *between 1950 and 1965...*
 Not: *between 1950–1965...*

When expressing a range denoting units of measurement, whether spelled out units or an abbreviation or symbol, include the unit of measurement with the second number in the range only.

Examples: Use: *from 5 to 67 mm long...*
 Not: *from 5 mm to 67 mm long...*

 Use: *between 10 and 30% of the...*
 Not: *between 10% and 33% of the...*

b. General/Nonscientific Style

The same rules apply except that words are used for 2-digit whole numbers (see Section 8.2).

8.7 Ages of Animals and Fish

Use Arabic rather than Roman numerals in age notation (age 3, *not* age III). An animal or fish that is less than a year of age is *age 0*; avoid adding plus signs (+) to any ages. Also see *salmon ages* in Section 6.

Hyphenate ages that serve as adjectives (e.g., *age-1 trout had...*), but not those used as nouns (e.g., *trout that were age 1 had...*). Always hyphenate *n-year-old(s)*, but not if *year* is plural (e.g., *bears 3 years old were...*).

When using European notation for salmon ages, to refer to just the freshwater age use a numeral followed by a period (age 1.). To refer to just the saltwater age use a period followed by a numeral (age .1). Otherwise, use 2 numerals separated by a period (age 1.1). Also see *salmon ages* in Section 6.